

WHAT IS CLAIMED:

1. A low-temperature process for producing pigment-grade rutile titanium dioxide from an aqueous solution comprising the following sequential steps:
 - a. preparing an aqueous feed solution comprising a titanium compound;
 - 5 b. adding an effective amount of a catalyzing salt to the solution;
 - c. optionally adding a chemical control agent to the solution;
 - d. evaporating the solution to produce a dry amorphous intermediate that includes a mixture of titanium compounds; and
 - e. calcining the intermediate to form TiO_2 rutile pigment base.
- 10 2. The process of claim 1 further comprising washing the salt from the calcined TiO_2 rutile pigment base.
3. The process of claim 2 further comprising milling and dispersing the TiO_2 rutile pigment.
4. The process of claim 1 wherein the titanium compound is selected from the
15 group of titanium chloride, titanium oxychloride, and mixtures thereof.
5. The process of claim 1 wherein the titanium compound is titanium oxychloride.
6. The process of claim 1 wherein the catalyzing salt is a salt of an alkali metal.
7. The process of claim 1 wherein the catalyzing salt is selected from the group consisting of chloride salts.
- 20 8. The process of claim 7 wherein the chloride salts are selected from the group consisting of NaCl , KCl , LiCl and mixtures thereof.
9. The process of claim 7 wherein the chloride salts comprise a eutectic mixture of NaCl , KCl , and LiCl .

10. The process of claim 7 wherein the chloride salts comprise a eutectic mixture of LiCl and KCl.
11. The process of claim 7 wherein the chloride salts comprise a eutectic mixture of LiCl and NaCl.
- 5 12. The process of claim 1 wherein the catalyzing salt is present in the feed solution in an amount from about 3 weight % of the equivalent amount of TiO_2 present in the feed solution and the amount corresponding to the saturation point of the catalyzing salt in the feed solution.
- 10 13. The process of claim 1 wherein the catalyzing salt present in the feed solution is from about 10 weight % and about 50 weight % of the equivalent amount of TiO_2 present in the feed solution.
14. The process of claim 1 wherein the amount of the catalyzing salt is between about 15 weight % and about 30 weight % of the equivalent amount of TiO_2 present in the feed solution.
- 15 15. The process of claim 1 wherein the catalyzing salt does not significantly chemically react with titanium oxide through the process.
16. The process of claim 1 wherein the catalyzing salt does not significantly change chemical composition.
17. The process of claim 1 wherein the catalyzing salt is recycled.
- 20 18. The process of claim 1, wherein the TiO_2 rutile pigment base comprises an open network of rutile crystals.
19. The process of claim 1 wherein the catalyzing salt has a melting point of less than 800°C .
- 25 20. The process of claim 1 wherein the calcining is conducted at a temperature less than 800°C .

21. The process of claim 1 wherein the calcining is conducted at a temperature less than 700°C.
22. The process of claim 1 wherein the calcining is conducted at a temperature less than 600°C.
- 5 23. The process of claim 1 wherein the calcining is conducted at a temperature less than 500°C.
24. The process of claim 1 wherein the calcining is conducted at a temperature less than 400°C.
25. The process of claim 1 wherein the calcination time is between the time needed
10 to melt the catalyzing salt and about 24 h.
26. The process of claim 1 wherein the calcination time is less than about two hours.
27. The process of claim 1 wherein the calcination time is less than about 30 minutes.
28. The process of claim 1 wherein the calcination time for is less than about one
15 minute.
29. The process of claim 1 wherein the chemical control agent is added before evaporating.
30. The process of claim 27 wherein the chemical control agent is a water-soluble salt of tin.
- 20 31. The process of claim 27 wherein the chemical control agent is tin chloride.
32. The process of claim 1 wherein the evaporating is conducted in a spray drier.
33. The process of claim 1 wherein the evaporation temperature is between about 100°C and about 300°C.

34. The process of claim 1 wherein the amorphous intermediate comprises a homogeneous mixture of titanium, oxygen, chlorine, and hydrogen compounds, with a homogeneous distribution of salts through the titanium intermediate.
- 5 35. The process of claim 32 wherein the product after calcination comprises TiO_2 rutile crystallites bound in a structure of hollow spheres or parts of spheres.
36. The process of claim 33 wherein the spheres have a diameter of about 0.1 to about 100 μm .
37. The process of claim 33 wherein the crystallites have a particle size between about 10 nm and 1000 nm.
- 10 38. The process of claim 33 wherein the crystallites have a particle size between about 50 nm and 500 nm.
39. The process of claim 33 wherein the crystallites forming the hollow spheres have a particle size between about 100 nm and 300 nm.
- 15 40. The process of claim 1 wherein the washing is conducted with water to provide an aqueous salt solution and the TiO_2 rutile pigment base.
41. The process of claim 40 further comprising recycling the salts in the aqueous salt solution.
42. The process of claim 41 further comprising milling the washed TiO_2 rutile pigment base product.
- 20 43. The process of claim 1 wherein a thermodynamically unstable brookite phase is formed as an intermediate during the early stages of calcination.